Project Development Activities Outside of the U.S.

Concentrating Solar Power in the Emerging Marketplace
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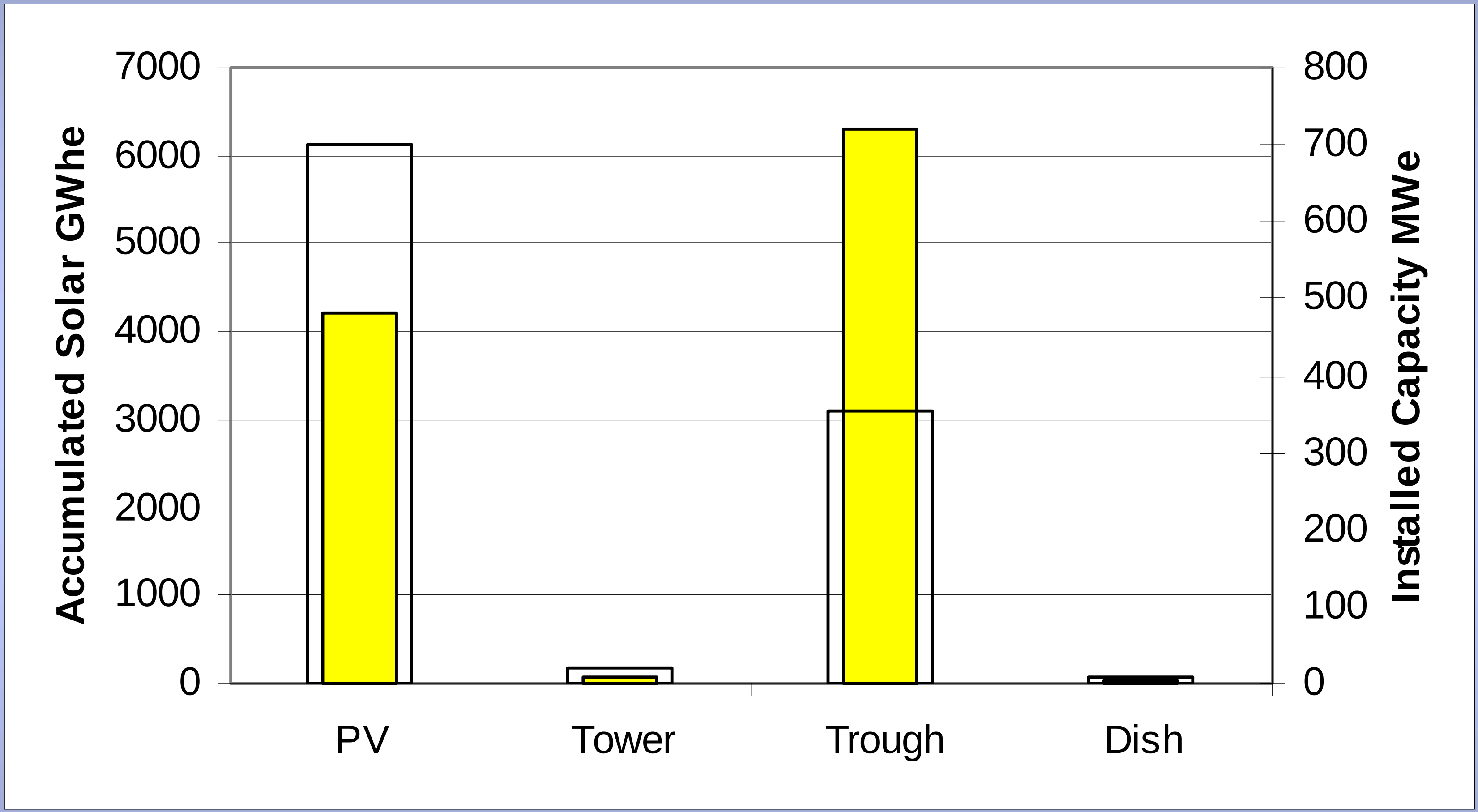
The Promise of Solar Thermal Power

- **Solar radiation** is the **largest renewable resource on earth**. App. **1% of the world's desert area** is sufficient to **generate** the **world's entire electricity demand for the year 2000**.
- This energy **resource** is more **evenly distributed in the sunbelt** of the world than wind or biomass resources, allowing for more site locations.
- **Solar thermal power can be easily integrated into conventional steam or combined cycle power plants** and by this into already existing power plant parks at very little incremental cost

Operating Status of Solar Power Technologies

(worldwide)



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The Promise of Solar Thermal Power (cont.)

- **Most cost effective solar power technology**
  Power generation costs in the range of 6 to 15 US cents/kWhe. **Promising mid-term cost competitiveness** with large fossil-fueled thermal power plants.
- **Well-proven and demonstrated technology**.
  Over 100 years of accumulated operating experience with nine solar thermal power plants of the parabolic trough type
- **Over 7 billion kWh of solar-based electricity at Kramer Jct. & Harper Lake sites in the Californian Mojave Desert**
- Now **ready for widespread application**. Over 500 MW solar capacity under development
- Production facilities for 200 MW/year of solar capacity already existing

Side view of Kramer Jct. 30 MWe Solar Field

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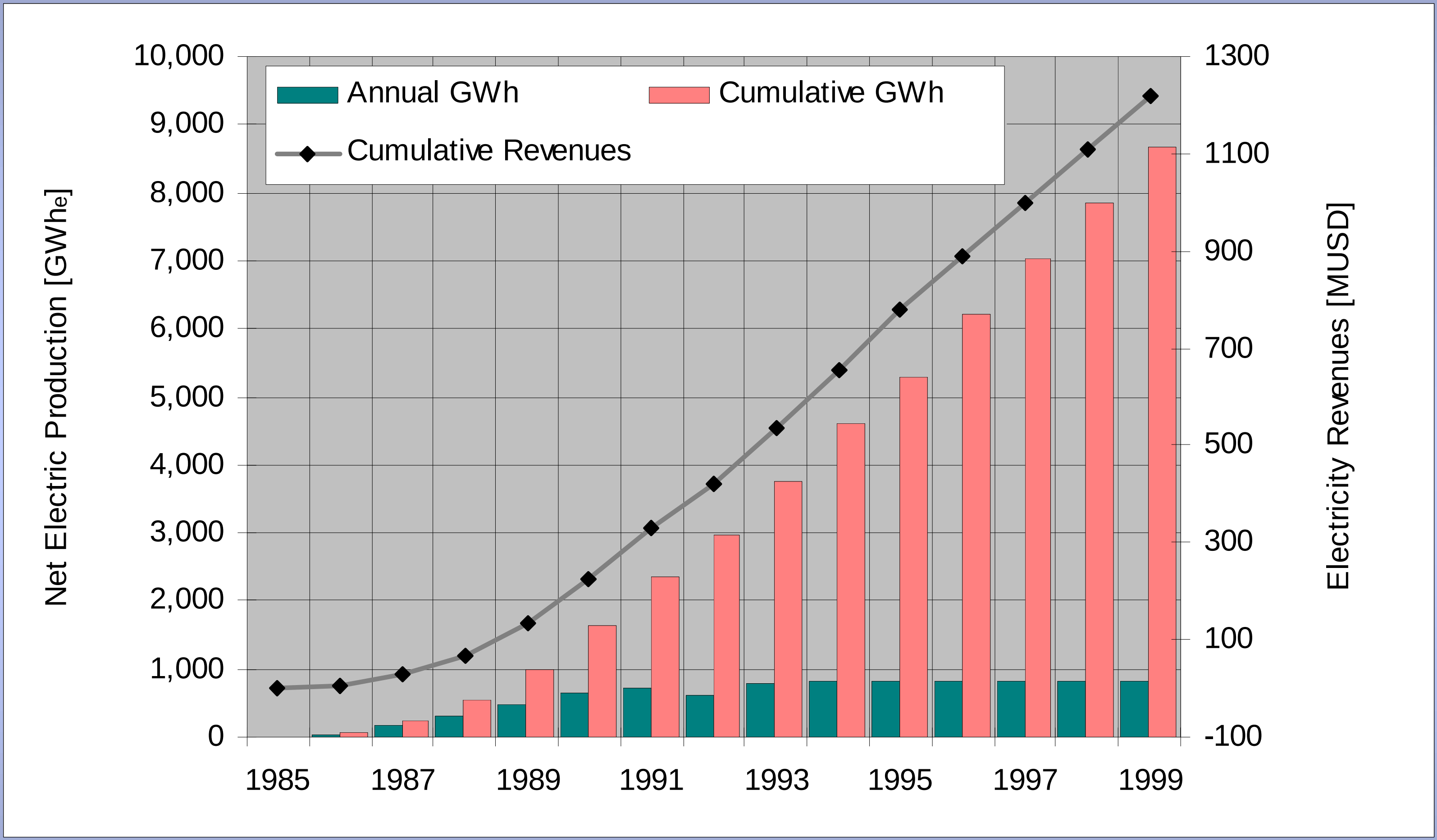
Accumulated production and revenues of 9 SEGS plants in California



60% des weltweit bisher erzeugten Solarstroms wurde in den

9 SEGS Kraftwerken in Kalifornien produziert

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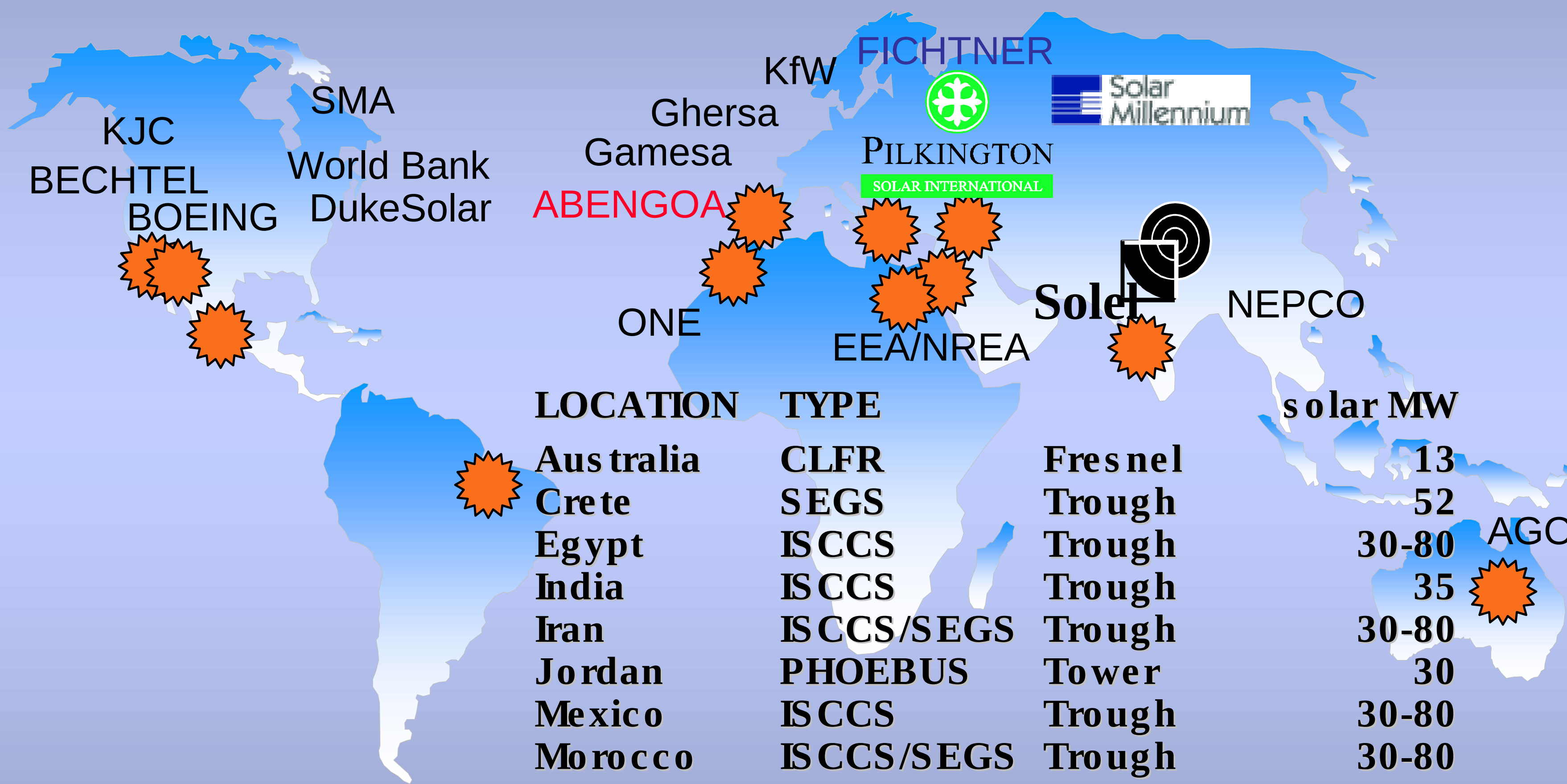
Current STP Project Developments & Players



LOCATION	TYPE		solar MW
Australia	CLFR	Fresnel	13
Crete	SEGS	Trough	52
Egypt	ISCCS	Trough	30-80
India	ISCCS	Trough	35
Iran	ISCCS/SEGS	Trough	30-80
Jordan	PHOEBUS	Tower	30
Mexico	ISCCS	Trough	30-80
Morocco	ISCCS/SEGS	Trough	30-80
Spain	SEGS, SP10	Trough,Tower	10-50
USA	SEGS	Trough	354

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Advanced Solar Trough Project Developments

50 MWe Standard SEGS, Crete, Greece

Developer/Sponsor: PilkSolar & Fichtner Solar / Solar Millennium & EU, DG XVII

2 x 50 MWe Standard SEGS systems, Spain

Developer/Sponsor: Abengoa, Gamesa & Pilksolar / Solar Millennium

178 MWe ISCCS, Northern Morocco

Developer/Sponsor: PilkSolar, Fichtner Solar & DLR / EU (DGI) + GEF

135 MWe ISCCS, Rajasthan, India

Developer/Sponsor: Fichtner Solar & DLR / KfW + GEF

140 - 300 MWe ISCCS, Northern Mexico

Developer/Sponsor: CFE, Spencer Management, Bechtel & others / GEF

140 MWe ISCCS, Egypt

Developer/Sponsor: NREA, IEA SolarPaces & Lahmeyer, ZSW / GEF

Troughs cont. & Power Tower Developments

298 MWe ISCCS, Yazd, Central Iran

Developer/Sponsor: PilkSolar & Fichtner Solar / Tavanir & potentially GEF + KfW

100 MWe Standard SEGS + 6 h thermal storage, Northern Cape Province, South Africa

Developer/Sponsor: IEA SolarPaces & ESKOM / ESKOM & potentially GEF

Power Towers

10 MWe SP10, Spain

Developer/Sponsor: Abengoa, Inabensa / EU DG TREN, Abengoa + Private Investors

10 MWe Solar Tres, Spain

Developer/Sponsor: Ghersa, Bechtel, Boeing / Private Investors

178 MWe ISCCS, Northern Morocco + 140 MWe ISCCS, Egypt

(May potentially be built as power tower systems)

Regulatory Inconsistencies for STP in Europe

- In high value markets (attractive compensation for clean power) **S**olar **T**hermal **P**ower is either:

  - **not regulated** in the national legislation (e.g. in Germany, Greece and Italy) and by this not eligible for favorable tariffs

  - or **forced** to produce its output **purely solar** (e.g. in Greece and Spain) which creates additional need for subsidies although the solar output would be the same and hybrid operation would much better comfort load requirements
- **Solar power import** from European member states is principally possible but not eligible for compensation under the prevailing national regulation (i.e., most cost effective solution not allowed)
- **Renewable regulation is miles behind current power market liberalization!**

Regulatory Shortcomings in GEF Countries

- **Most** current **GEF-sponsored project implementations are significantly delayed** as these countries don‘t have established mechanisms for independent privately owned and financed power schemes
- In most cases, these **solar project developments need regulatory improvements** - which cost more money and time
- The **GEF grant financing** offer – created to buy-down the extra cost of the clean, but capital intensive solar field investment - **triggers other** than just focused project implemetation **expectations in the recipient countries**
- **Why only project host country** governments **can receive** the GEF **support?** Won‘t a devoted developer be more effective?

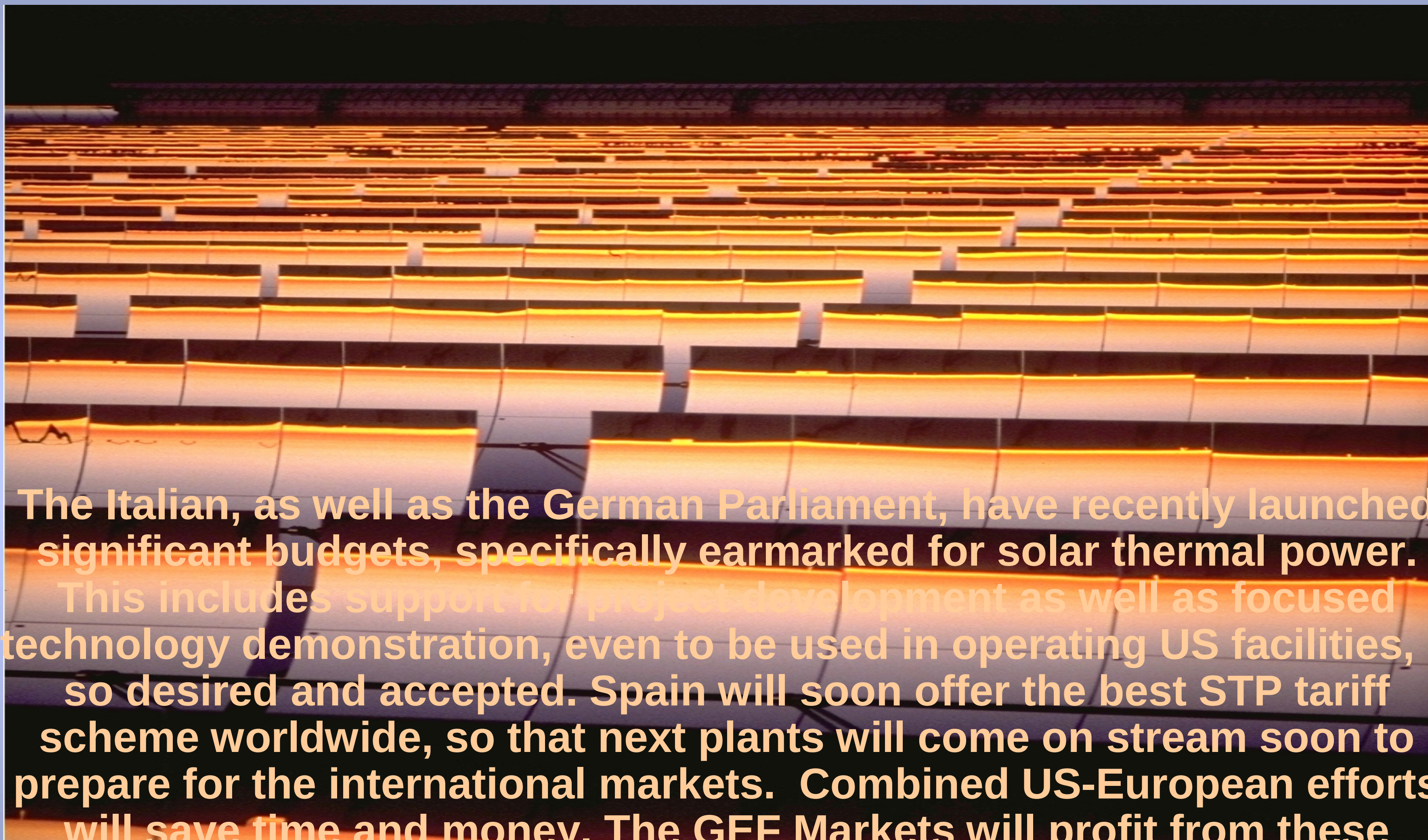
Market Introduction Strategy

1. **Solar Field Additions**: small solar fields can be integrated into combined cycle and coal- or fuel oil-fired steam power plants for only $700 to 1500 per kW installed.
2. **Increased Solar Share**: With increasing fossil fuel prices, compensation premiums for CO 2 avoidance and solar field cost reductions, solar shares can be increased to about 50% in solar/fossil hybrid power stations.
3. **Thermal Energy Storage**: With further rising fuel price levels, thermal energy storage will be able to further substitute the need of a fossil back-up fuel source. In the long run, base-load operated solar thermal power plants without any fossil fuel addition are in principle competitive.

The Solar Thermal Project Development Credo

- **Today, solar thermal power is competitive with**
- \- fossil fuel prices of about $ 40 per barrel
- \- or with a tariff of 13 cents per kWhe, in solar only or 8-10 cents per kWhe in hybrid mode (under Mojave desert radiation conditions)
- **We don‘t want subsidies**, **we want fair compensation for clean and dispatchable peaking power!**
- Regulation should **offer long-term PPA‘s** (15 years or so) starting with **13 cts for the initial 200 MWe**, 11 cts. for the next 200 MWe, **decreasing to 8 cts/kWhe** when reaching 1,000 MWe
- This would be a **strategic, consistent industry and environmental policy programme** – European governments and companies are ready to join and support

The next step: 2x100 MWe joint US - European commercial projects in California



The Italian, as well as the German Parliament, have recently launched significant budgets, specifically earmarked for solar thermal power. This includes support for project development as well as focused technology demonstration, even to be used in operating US facilities, if so desired and accepted. Spain will soon offer the best STP tariff scheme worldwide, so that next plants will come on stream soon to prepare for the international markets. Combined US-European efforts will save time and money. The GEF Markets will profit from these focused activities.

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